2/2/17 "A mistake is food for a new invention." -Anonymous

HW: "Vertical Streching of Functions" homework section

AIM: How do we stretch functions vertically?

Warm Up:

What is the vertex of $f(x) = -2.5(x-4)^2 - 18$?

Vertex = $(4, -18)$

Vertex Form = $a(x-h)^2 + k$

Vertex (h, k)

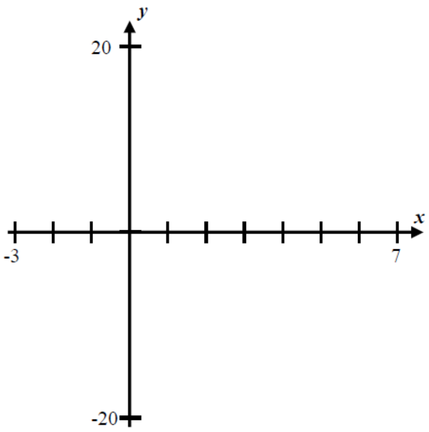
***Exercise* #1:** Consider the quadratic function $f(x)=x^2-4x-5$. The quadratic functions g and h are defined by the formulas $g(x)=2f(x)$ and $h(x)=\frac{1}{2}f(x)$.

(a) Determine formulas for both g and h in simplest trinomial form.

$g(x)=2(x^2-4x-5)=2x^2-8x-10$

$h(x)=\frac{1}{2}(x^2-4x-5)=\frac{1}{2}x^2-2x-\frac{5}{2}$

(b) Using your calculator, sketch and label each curve on the set of axes below. Use the window indicated by the axes.



(c) Using the **MINIMUM** command on your calculator, determine the minimum value for each function.

$f_{min}=-9$

$g_{min}=-18$

$h_{min}=-4.5$

(d) What points did not vary when f was vertically dilated by factors of 2 and **1/2**? Explain why this happened.

The zeros (x-intercepts) do not change.

Multiplying a 0 by any value will result in 0.

VERTICAL DILATIONS OF FUNCTIONS

The function $h(x)=k\cdot f(x)$ represents a vertical stretch of the function $f(x)$ if $k>1$ and a vertical compression of the function $f(x)$ if $0<k<1$. (y-values change)

***Exercise* #2:** If the point $(-3,12)$ lies on the graph of the function $y=f(x)$, which of the following points *must* lie on the graph of $y=3f(x)$? → multiply y by 3

$12\times3=36$

(1) $(-9,36)$ (3) $(-3,4)$

(2) $(-3,36)$ (4) $(-9,12)$

***Exercise* #3:** The graph of $y=f(x)$ is shown below. Consider the function $y=g(x)$ defined by $g(x)=2f(x)-3$.

✱ Transformations follow PEMDAS

(a) What two transformations have occurred to the graph of f in order to produce the graph of g? Specify both the transformations and their order.

$g(x)=2f(x)-3$

Stretch by a factor of 2 (First)

Shift down 3 (second)

(b) Graph and label $y=g(x)$

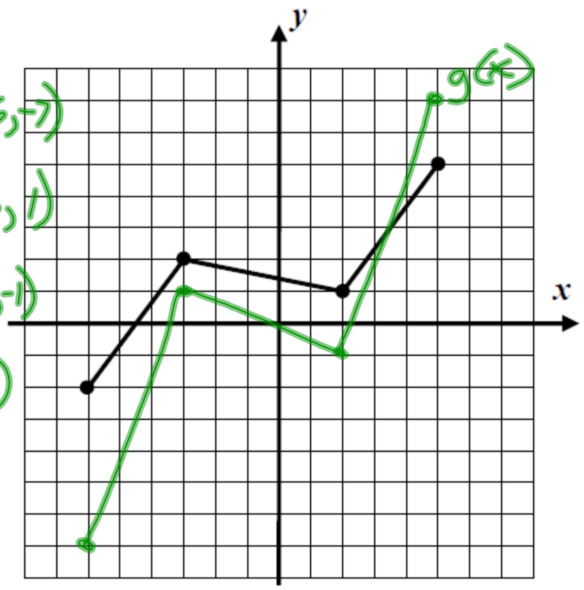
Stretch by 2 | Down 3

$(-6,-2)\rightarrow(-6,-4)\rightarrow(-6,-7)$

$(-3,2)$ $\xrightarrow{y\cdot2}$ $(-3,4)$ $\xrightarrow{y-3}$ $(-3,1)$

$(2,1)$ $(2,2)\rightarrow(2,-1)$

$(5,5)$ $(5,10)$ $(5,7)$



***Exercise* #4:** The function $h(x)$ has a range given by the interval $[2,10]$. The function $f(x)$ is defined by $f(x)=\frac{3}{2}h(x)+8$. Which of the following gives the range of $f(x)$?

(1) $[11, 23]$ (3) $[15, 27]$

(2) $[8, 12]$ (4) $[6, 32]$

***Exercise* #5:** If the quadratic function $g(x)$ has a y-intercept of 12, which of the following is true about the function $h(x)=3g(x)-5$?

(1) It has a y-intercept of -5.
(2) It has a y-intercept of 21.
(3) It has a y-intercept of -15.
(4) It has a y-intercept of 31.